MATHS

BOOKS - SHARAM PUBLICATION

APPLICATIONS OF DERIVATIVES

Example

1. Write the interval in which the function $\sin^2 x - x$ is increasing.

Watch Video Solution

2. Write that condition of Rolle's theorem which is violated by the function $f(x) = |x - 1|$ in $[0, 2]$.

Watch Video Solution

3. or the curve $y = 3x^2 + 4x$, find the slope of the tangent to the curve at a point where x-coordinate is -2

Watch Video Solution

4. What is the acceleration, at the end of 2 s of the particle that moves with rule $s = \sqrt{t} + 1$?

Watch Video Solution

5. Write the interval in which the function $\sin^2 x - x$ is increasing.

Watch Video Solution

6. Write the maximum value of the function $y = x^5$ in the interval [1, 5].

Watch Video Solution

7. Mention the values of xfor whichthe function f(x) = $x^3 - 12x$ is decreasing,

Watch Video Solution

8. Find the point on the curves x = a(θ - sin θ) and y=a(1 - cosθ), at which the tangent is

parallel to X-axis.

Watch Video Solution

9. If the tangent at each point of the curve $y = x^3 - ax^2 + x + 1$ is inclined at an acute angle with the positive direction of x-axis then find a.

Watch Video Solution

10. Find the open interval in which $f(x) = x^{\frac{1}{x}}, x > 0$ is decreasing.

Watch Video Solution

11. Find the intervals in which the function $y = \frac{Inx}{x}$ is increasing and decreasing.

Watch Video Solution

12. For which value of x, the function f(x) = 5-6x is increasing.

Watch Video Solution

13. What is thevalue of a for which the function $f(x) = a\sin x + \frac{1}{3}\sin 3x$ hasan extremum at$x = \frac{\pi}{3}$?

Watch Video Solution

14. If f(x) = sin x + 2 in the interval $\left[-\frac{\pi}{2}, \frac{\pi}{2}\right]$, what can you say about the greatest value of f(x)?

Watch Video Solution

15. Find interval (s) in which the function $f(x) = \sin x + \cos x, x \in (0, \pi/2)$ is increaing or decreasing.

Watch Video Solution

16. Find the extreme points of the function $y = x + \frac{1}{x}$.

Watch Video Solution

17. What is the equation of the normal to the curve $y = \sqrt{x}$ at the point $\left(\frac{1}{4}, \frac{1}{2}\right)$?

Watch Video Solution

18. Write the equation of the tangent to file curve $y = |x|$ at the point (-2, 2).

Watch Video Solution

19. If the tangent to the curve $x = at^2$, y = 2at is perpendicular to x-axis then what is its point of contact ?

Watch Video Solution

20. What is the equation of the normal to the curve y = sinx at (0, 0)

Watch Video Solution

21. If $f(x) = x^3 + ax^2 + bx + 5\sin^2 x$ be an increasing function on the set R, then what is the relation between a and b ?

Watch Video Solution

22. If f and g are two increasing functions then show that fog is an increasing function.

 Watch Video Solution

23. Mentionthevaluesofxfor which thefunction $f(x) = x^3 - 12x$ is increasing.

 Watch Video Solution

24. Write the maximum value of the function $y = x^5$ in the interval [1, 5].

Watch Video Solution

25. What is the slope of the normal to the curve $2y = 3 - x^2$ at the point (1,1)?

Watch Video Solution

26. Find the equation of the tangent to the curve $x = y^2 - 1$ at the point where the slope of the normal to the curve is 2.

Watch Video Solution

27. Find approxiamately the difference between the volumes of two cubes of sides 4 cm and 4.03 cm.

Watch Video Solution

28. Find the open interval in which $f(x) = x^{\frac{1}{x}}, x > 0$ is decreasing.

Watch Video Solution

29. Evaluate $\lim_{x \to \frac{\pi}{2}} (\sec x - \tan x)$

Watch Video Solution

30. Find the intervals in which the function $y = \frac{Inx}{x}$ is increasing and decreasing.

Watch Video Solution

31. Write the equation of the tangent to file curve $y = |x|$ at the point (-2, 2).

Watch Video Solution

32. Find the intervals in which the function $y = \frac{Inx}{x}$ is increasing and decreasing.

Watch Video Solution

33. Write the set of points, where the function $f(x) = x^3$ has relative (local) extreme.

Watch Video Solution

34. Determine the interval in which $g(x) = \frac{x^2 + 3x + 3}{x + 1}$ is decreaing.

Watch Video Solution

35. Write slope of the tangent to the curve $y = \sqrt{3}\sin x + \cos x$ at $\left[\frac{\pi}{3}, 2\right]$

Watch Video Solution

36. What is the slope of the normal to the curve $x^{\frac{2}{3}} + y^{\frac{2}{3}} = 20$ at the point (8, 64)?

Watch Video Solution

37. Write'the x-coordinate of the extreme point of the function $y = \cos x + \sin x, x \in \left[0, \frac{\pi}{2}\right]$

Watch Video Solution

38. For what value of x, is the function $f(x) = 3 - 2x^2$ the maximum?

Watch Video Solution

39. Write the subinterval of $(0, \pi)$ in which $\sin\left(x + \frac{\pi}{4}\right)$ is increasing.

Watch Video Solution

40. The curves $y = 4x^2 + 2x - 8$ and $y = x^3 - x + 10$ touch each other at the point (3, 4). TRUE or FALSE

Watch Video Solution

41. Show that the tangent to the curve $x = a(t - \sin t), y = at(1 + \cos t)$ at $t = \frac{\pi}{2}$ has slope.(1- pi/2)`

Watch Video Solution

42. Find the approximate value of $\sqrt{48.96}$

Watch Video Solution

43. Find the point on the curve

$x^2 + y^2 - 4xy + 2 = 0$

where the normal is paralell to the x-asis.

Watch Video Solution

44. Show that `2 sin x + than x ge 3x all x in (0, pi/20).

Watch Video Solution

45. Show that the sum of the intercepts on the coordinate axes of any tangent to the curve $\sqrt{x}+\sqrt{y}=\sqrt{a}$ is constant.

Watch Video Solution

46. Find the interval in which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is strictly increasing.

Watch Video Solution

47. Find the interval in which the function $f(x) = 3x^4 - 4x^3 - 12x^2 + 5$ is strictly increasing.

Watch Video Solution

48. Prove that: $y = \frac{4\sin\theta}{2+\cos\theta} - \theta$ is an increasing function in [0,pi/2]`

Watch Video Solution

49. Show that the function $f(x) = x^3 - 3x^2 + 3x, x \in R$ is increasing on R.

Watch Video Solution

50. Find the.equations of tangent and normal to the curves $x = a\sin^3\theta$ and $y = a\cos^3\theta$ at $\theta = \frac{\pi}{4}$

Watch Video Solution

51. Find the points on curve $y = x^3 - 11x + 5$ at which equation of the tangent is y = x-11

Watch Video Solution

52. Find the points onthe curve $x^2 + y^2 - 2x - 3 = 0$ atwhich tangent is parallel to x-axis.

Watch Video Solution

53. Find the equation of tangent to the curve $x = \sin 3t, y = \cos 2tatt = \frac{\pi}{4}$

Watch Video Solution

54. Find the equation of thetangent to the curve $y = x^4 - 6x^3 + 13x^2 - 10x + 2$ at the point (1, 0)

Watch Video Solution

55. Find the equation of tangent to the curve $x^2 + 3y = 3$ which is parallel to y - 4x + 5 = 0

Watch Video Solution

56. Find the equation of the normal to the curve $y = (\log x)^2$ at $x = \frac{1}{e}$.

Watch Video Solution

57. The sum of two numbers is 24. Find the numbers, so that their product is maximum.

Watch Video Solution

58. Find two positive numbers whose product is 256 and whose sum is least.

Watch Video Solution

59. Show that all the rectangles with a given perimeter, the square has the largest area.

Watch Video Solution

60. Find the intervals where function is increasing function y = cos x + sin x,x $\varepsilon[0, 2\pi]$

Watch Video Solution

61. Show that `2 sin x + than x ge 3x all x in (0, pi/20).

Watch Video Solution

62. Find the approximate value of $\sqrt[6]{63}$.

Watch Video Solution

63. Find the equation to the tangent and normal tothe parabola $y^2 = 4ax$ at the point $(at^2, 2at)$.

Watch Video Solution

64. Show that no two normals to a parabola are parallel.

Watch Video Solution

65. The slope of the curve $2y^2 = ax^2 + b$ at (1, -1) is- 1. Find a and b.

Watch Video Solution

66. Find the equation of the normal to the curve $y = 2x^2 + 3$ sin x at x = 0

Watch Video Solution

67. Determine the point on the curve y = ln x, at which the tangent will be parallel to the chord joining the points P(1, 0) and Q(e, 1).

Watch Video Solution

68. Find the extreme values of the function $y = X + \frac{1}{x}$.

Watch Video Solution

69. Find the maximum and minimum value of $x + \frac{1}{x}$

Watch Video Solution

70. Find the intervals in which the function $f(x) = 2x^3 + 9x^2 + 12x + 20$ is increasing and decreasing.

Watch Video Solution

71. For which value of x, the function $f(x) = 4 - x - x^2$ is maximum or minimum.

Watch Video Solution

72. etermine the sub-interval of $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$, in which f(x)=tan x-4x is increasing.

Watch Video Solution

73. Find the equation of the normal to the curve

$5x^2 + 3y^2 = 23$ at (2,-1)

Watch Video Solution

74. Find the slope of the tangent to the curve

$y = (\log_e x)^2$ at $x = \frac{1}{e}$

Watch Video Solution

75. Find the equation of normal to the curve $3y^2 = 16x$ at (3,4).

Watch Video Solution

76. Determine the point on the curve y = ln x, at which the tangent will be parallel to the chord joining the points P(1, 0) and Q(e, 1).

Watch Video Solution

77. Find the equation of the tangent to the curve $x = y^2 - 1$ at the point where the slope of the normal to the curve is 2.

Watch Video Solution

78. Find approxiamately the difference between the volumes of two cubes of sides 4 cm and 4.03 cm.

Watch Video Solution

79. Find the set of value of x where the function $f(x) = 2x^3 + 3x^2 - 36x - 7$ is increasing or decreasing.

Watch Video Solution

80. Find the value of.x for which the function $f(x) = x^4 — 4x^3 + 4x^2 - 1$ is maximum or minimum.

Watch Video Solution

81. Find the extreme point of the function $f(x) = \sin x \cos x, x \in \left(\frac{\pi}{8}, \frac{\pi}{2}\right)$.

Watch Video Solution

82. Using differential, find approximately the difference between the volumes of two cubes of sides 2 cm and 2.01 cm.

Watch Video Solution

83. Show that the semivertical angle of a cone of given slant height is $\tan^1\sqrt{2}$ when its volume is maximum.

Watch Video Solution

84. Show that the radius of the right cicular cylinder of greatest curved surface that can be inscribed in a given cone is half the redius of the base of the cone.

Watch Video Solution

85. A cylindrical open water tank with a circular base is to be made out of 30 sq metres of metal sheet. Find the dimensions so that it can hold maximum water. (Neglect thickness of sheet).

Watch Video Solution

86. Show that the semi-vertical angle of the cone of the maximum volume and of given slant height is $\frac{\cos^{-1}(1)}{\sqrt{3}}$.

Watch Video Solution

87. Show that the height of a closed right circular cylinder of given surface and maximum volume is equal to diameter of base.

Watch Video Solution

88. Shows that the triangle of greatest area that can be inscribed in a circle is equilateral.

Watch Video Solution

89. Find the tangent to the curve $y = \cos(x + y), 0 \leq x \leq 2\pi$ which is parallel to the line x + 2y = 0

Watch Video Solution

90. Find the minimum distance of a point on the curve $\frac{2}{x^2} + \frac{1}{y^2} = 1$ from the origin.

Watch Video Solution

91. Find the minimum value of $64 \sec \theta + 27 \operatorname{cosec} \theta$ when θ lies in $\left(0, \frac{\pi}{2}\right)$

Watch Video Solution

92. Show that the minimum distance of a point on the curve $\frac{a^2}{x^2} + \frac{b^2}{y^2} = 1$ from the origin is a + b.

Watch Video Solution

93. Show that the length of the portion of the tangent to `x^(2/3) + y^(2/3) = a^(2/3) intercepted between the axes is constant.

Watch Video Solution

94. Show that the sum of the intercepts on the coordinate axes of any tangent to the curve $\sqrt{x} + \sqrt{y} = \sqrt{a}$ is constant.

Watch Video Solution

95. Find the equation of the normal to the curve given by $x = \cos^3\theta, y = \sin^3\theta at\theta = \frac{\pi}{4}$

Watch Video Solution

96. Find the point on the curve $y^2 - x^2 + 2x - 1 = 0$ where the tangent is parallel to the x-axis.

Watch Video Solution

97. Show that the tangent to the curve $y = x^2 + 3x - 2$ at (1,2) is parallel to tangent at (-1,1) to the curve $y = x^3 + 2x$.

Watch Video Solution

98. Show that the curves $y = 2^x$ and $y = 5^x$ intersect at an angle $\tan^{-1}\left|\frac{1n\left(\frac{5}{2}\right)}{1 + 1n21n5}\right|$.

Note Angle between two curves is the angle between their tangents at the point of intersection.

Watch Video Solution

99. Find the altitude of a right circular cylinder of maximum volume inscribed in a sphere of radius r.

Watch Video Solution

100. Find the coordinates of the point on the curve $x^2y - x + y = 0$

where the slope of the tangent is maximum.

Watch Video Solution

101. Find two numbers x and y whose sum is 15 such that xy^2 is maximum.

Watch Video Solution

102. Find the values of x for which $f(x) = x^4 + 2x^3 - 2x^2 - 6x + 5$ is locally maximum and minimum.

Watch Video Solution

103. Find the interval where y=sinx-cosx $x \in [0, 2\pi]$ is increasing.

Watch Video Solution

104. Find the maximum value of y=(1+cosx) sinx,x$\varepsilon \left[0, \frac{3\pi}{4}\right]$

Watch Video Solution

105. Obtain the extreme point of $f(x) = e^x\left(x^2 - 6x + 9\right)$. As certain whether they are maximum or minimum points. Find the extreme values at these points.

Watch Video Solution

106. Find the maximum of the function $f(x) = \left(\frac{1}{x}\right)^x$

Watch Video Solution

107. If a is positive, find the minimum value of $\frac{a+x}{\sqrt{ax}}$.

Watch Video Solution

108. Use the function $f(x) = x^{1/x}, x > 0$ to show that $e^{\pi} > \pi^{e}$.

Watch Video Solution

109. Mention the values of x for which the function $f(x) = x^2 - 12x$ is increasing.

Watch Video Solution

110. Find the interval for which the function f(x) = tanx- 4 (x- 2) is increasing and decreasing in $\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

Watch Video Solution

111. What is thevalue of a for which the function $f(x) = a\sin x + \frac{1}{3}\sin 3x$ hasan extremum at$x = \frac{\pi}{3}$?

Watch Video Solution

112. What is the maximum value of the function f(x)=sinx(1 + cos x) ?

Watch Video Solution

113. If f(x) = a In $x + bx^2 + x$ has extreme values at $x = -1$ and $x = 2$ then find a and b.

Watch Video Solution

114. Find the coordinates of a point on the parabola $y^2 = 8x$ which is at minimum distance from the circle $x^2 + (y + 6)^2 = 1$

Watch Video Solution

115. Find the difference between the greatest and least values of the function $f(x) = \cos x + \frac{1}{2}\cos 2x - \frac{1}{3}\cos 3x$

Watch Video Solution

116. If f(x) = a In $x + bx^2 + x$ has extreme values at $x = -1$ and $x = 2$ then find a and b.

Watch Video Solution

117. Find the approximate value of $(26.9)^{\frac{1}{3}}$

Watch Video Solution

118. Discuss the extreme value of the function

$y = (x+2)^4(x-1)^5$

Watch Video Solution